

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

ORIGINAL

In the matter of

Amendment of the Commission's Rules to Establish
New Personal Communications Services

To: The Commission

) Gen. Docket 90-31

) ET Docket 92-100

) PP-35-40, PP-79-85

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OFFICE OF THE SECRETARY

PCS COMMENTS OF BELL SOUTH

BELLSOUTH CORPORATION
BELLSOUTH TELECOMMUNICATIONS, INC.
BELLSOUTH ENTERPRISES, INC.

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Their Attorneys

November 9, 1992.

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SUMMARY

BellSouth is committed to the prompt introduction of *new* wireless services developed through the application of innovative technology. Given its longstanding performance as a provider of landline and wireless exchange services, and its experience with experimental low-power PCS services, BellSouth believes it should be fully eligible for PCS licenses granted as a result of this proceeding.

The *Emerging Technologies* docket has already set the stage for the creation of a new low-power service that will give consumers new communications options, and, as a by-product, will engender more competition for cellular carriers and LECs. The *Emerging Technologies* docket is explicitly based on carrying out the mandate of Section 7(a) of the Act, which declares that it is the policy of the United States to encourage new technologies and services. Section 7 was enacted to promote United States leadership in new technologies and services in the global marketplace.

In light of Section 7, and the purpose of the *Emerging Technologies* spectrum reserve, the Commission's core goal here must be to license *new* PCS services, and it must develop rules which will further the national policy of U.S. global competitiveness. Moreover, only the creation of *new* wireless personal communications services and technologies can justify the potential relocation of many current users in the 2 GHz band.

BellSouth's proposal to meet the new services/international competitiveness goal is as follows:

- Define the scope of the 2 GHz allocation to be low-power "microcell" personal communications services providing a wide variety of inexpensive, convenient, localized services.
- Authorize five 20 MHz licensees, provide a 20 MHz band for unlicensed PCS, allow the use of 10 MHz for wireless local loop applications, and provide 3 MHz of spectrum at 900 MHz for narrowband PCS.
- Use MSAs and RSAs as the market areas for licensing purposes, in order to ensure service that meets the needs of local communities.
- Open eligibility for licenses, in order to ensure wide participation by a diverse group of providers, including cable television operators, telephone companies, cellular carriers, competitive access providers, and others, thereby maximizing U.S. competitiveness in world markets.
- Use auctions for awarding licenses, with no restrictions on alienation of licenses, in order to encourage the most productive use of spectrum.

Based on the record of PCS experiments in the U.S. and PCS experience abroad, the "new personal communications services" at issue in this proceeding should be defined as low-power microcell services. This is the only group of services that can rationally be authorized consistent with the "new services" purpose of this proceeding. Allowing licensees to operate as cellular clones (*i.e.*, high power and large-cell service) in this band would be inconsistent with the core objective of this proceeding, the *Emerging Technologies* docket, and the carefully balanced and specific regulatory scheme set out in the Communications Act. Creating a low-power microcell service will substantially conserve FCC resources by minimizing the need to resolve the numerous interference and system

disputes that high-power service has engendered in cellular and would engender in PCS and will eliminate the need to regulate tall towers.

BellSouth proposes that five 20 MHz licenses be authorized on an MSA/RSA basis with completely open eligibility. This will allow for a varied array of competitors who will approach the market from diverse vantage points. In turn, the core goal of U.S. international competitiveness will be served because many cellular providers and local exchange companies are substantial companies who can advance U.S. interests through their international wireless activities.

Cellular operators and local exchange carriers should be eligible for licenses to provide new personal communications services for many reasons. Their participation will ensure the speedy deployment of service by proven licensees with the expertise to build. To the extent these carriers will have economies of scale and infrastructure advantages, this will tend to keep costs lower and reduce prices, thus maximizing the universality of PCS. The entry of other large competitors such as cable and utility companies, which may have similar advantages, will ensure vigorous facilities-based competition. The Commission has historically recognized the contribution of existing service providers and has relied on their record of service to the public by ensuring they are able to participate in new service developments in their fields.

PCS should be licensed for MSAs and RSAs, because these represent real communities of interest and are also reasonably-sized areas well-suited for radio licensing. The Commission, the communications industry, and the financial community are already familiar with this licensing model. Moreover, the MSA/RSA model, unlike the larger areas proposed by the Commission, will allow for greater diversity of providers and service that will be more responsive to the needs of local communities. Localism — providing service to local communities based on their needs — is an important factor to be weighed in determining which policies will best serve the public interest under the Communications Act. Moreover, by using licensing areas that truly represent communities of interest the Commission will provide a standard for determining whether a licensee has served the public interest sufficiently to warrant renewal of its license.

BellSouth also supports the Commission's proposal to allot 10 MHz for wireless local loop applications, while reserving the opportunity for an additional allocation, if needed after initiating service. LECs and other providers of local landline service should be eligible for these licenses so that spectrum can be dedicated for the provision of new wireless local exchange services. This is particularly important when local exchange service is becoming increasingly competitive.

BellSouth also agrees with the Commission's auction proposal. This is by far the fastest method for deploying service. Auctions will, through the workings of the marketplace, ensure that spectrum is used in the way most valuable to society by a qualified licensee. In addition, it will provide the treasury (rather than speculators) with remuneration for the assignment of a scarce public resource. BellSouth includes draft legislation for Congressional authorization to use auctions.

The Commission has an obligation to define its real agenda here — to encourage the development and deployment of truly new wireless services and technologies, or instead merely to open the door for new cellular clones — and then to adopt a regulatory structure consistent with that purpose. Failure to do so would be unreasoned decisionmaking because the rules adopted must rationally serve the Commission's stated goal and the FCC may not treat licensees operating in an identical manner differently. If the Commission's real agenda is to clone cellular, it should begin a new proceeding to study competition in that industry and adopt a regulatory regime premised on a level playing field for all competitors.

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BellSouth Corporation, BellSouth Telecommunications, Inc., and BellSouth Enterprises, Inc. (collectively "BellSouth") hereby submit their comments in response to the Commission's *NPRM* in the referenced dockets.¹

INTRODUCTION

In Section I of these Comments, BellSouth establishes that, consistent with Section 7 of the Communications Act and the stated purpose of the *Emerging Technologies* spectrum reserve proceeding, the core goal here must be the encouragement of *new* services and technologies. In Section II, BellSouth sets forth its proposal for PCS in detail, showing how it will serve the core goal of the proceeding and further the values identified in the *NPRM*. In Section III, BellSouth demonstrates that if the Commission's real agenda is to create additional cellular competition, rather than the encouragement of new services and technologies, the Commission must begin another proceeding and create rules based on that objective and the record developed therein.

BellSouth has appended proposed rules and regulations to implement its proposal, as well as other supporting materials:

¹ Notice of Proposed Rulemaking and Tentative Decision, 7 FCC Rcd. 5676 (1992) ("*NPRM*"); see also Notice of Inquiry, 5 FCC Rcd. 3995 (1990).

- Appendix I contains proposed rules and regulations that will license in the shortest time a diverse array of responsible carriers for the provision of new wireless services.
- Appendix II is a study entitled, *The Development of PCS in the U.K.: Lessons for the FCC*, by Chris Doyle, Ph.D., Senior Research Officer in the Department of Applied Economics, at the University of Cambridge ("Doyle Study").
- Appendix III is a paper entitled, *Financial Analysis: MSAs and RSAs Should Be Used for PCS Allocation Purposes and Experienced Companies Should be Eligible to Participate*, by Wayne D. Gantt, Financial Analyst ("Gantt Report").
- Appendix IV is a study entitled, *Assigning PCS Spectrum: An Economic Analysis of Eligibility Requirements and Licensing Mechanisms*, prepared by the economic consulting firm of National Economic Research Associates, Inc., under the direction of Richard Schmalensee and William Taylor ("NERA Study").

DISCUSSION

I. THE COMMISSION'S CORE GOAL MUST BE THE ADVANCEMENT OF NEW WIRELESS SERVICES AND TECHNOLOGIES

A. The Commission Has a Mandate to Encourage New Wireless Technologies and Services in Order to Enhance the Competitiveness of the United States

The driving force behind this proceeding must be the Commission's statutory mandate as expressed in Section 7(a) of the Communications Act:

It shall be the policy of the United States to encourage the provision of new technologies and services to the public.²

In enacting Section 7, Congress declared the intention of the United States to lead the world in new technologies and services that are of increasing importance to an evolving global economy. The central purpose of the legislation is to "*provid[e] U.S. leadership in the new world information era.*"³

² 47 U.S.C. § 157(a).

³ H.R. Rep. No. 98-356, 98th Cong. 1st Sess. (Sept. 15, 1983), *reprinted in* 1983 U.S.C.C.A.N. 2219, 2221 (emphasis added).

In accordance with this objective, the Commission found in the *Emerging Technologies* proceeding, Gen. Docket 92-9, that there was a pressing "need for additional spectrum to foster the growth and development of new services" and to "ensure the future competitiveness of the United States' communications industry in international markets."⁴ Thus, in developing policies for domestic spectrum usage here, the FCC is charged with advancing the international standing of the United States to the greatest extent possible.⁵

United States companies, and BellSouth in particular, have taken a leading role in the international development of cellular radio and other wireless technologies and services based on their domestic experience.⁶ Therefore, to "promote the ability of American industry to maintain its competitive leadership position in global telecommunications markets,"⁷ the Commission should encourage participation by the widest possible variety of U.S. companies — and in particular its most experienced and proven wireless leaders — in the development and deployment of new, advanced wireless technologies and services. The Commission has already recognized that the United States

⁴ See *Redevelopment of Spectrum to Encourage Innovation in the Use of New Telecommunications Technologies* ("Emerging Technologies"), Gen. Docket 92-9, *First Report and Order and Third Notice of Proposed Rulemaking*, FCC 92-437 at ¶ 2 (released October 16, 1992) (*Emerging Technologies R&O*); see *Notice of Proposed Rulemaking*, 7 FCC Rcd. 1542 (1992) (*Emerging Technologies NPRM*); *Second Notice of Proposed Rulemaking*, FCC 92-357 (released September 4, 1992); see also 47 C.F.R. §§ 1.402, 1.403, and 5.207. In the *Emerging Technologies NPRM*, the Commission recognized that the "heavily used" 2 GHz band would be difficult to redevelop for emerging technologies, but found that the congressional mandate in Section 7 could not be ignored; accordingly, the Commission acknowledged that it "is in the best interest of the United States to make spectrum available for the development of new services and technologies." 7 FCC Rcd. at 1543.

⁵ Apparently through oversight, the *NPRM* does not explicitly cite Section 7 as one of its statutory bases. See *NPRM*, 7 FCC Rcd. at 5740, 5741. However, the Commission emphasizes both the introduction of new services and technologies and the importance of U.S. leadership in the global telecommunications marketplace as among the driving forces for the proceeding. See, e.g., *NPRM*, 7 FCC Rcd. at 5687-88.

⁶ *Id.* Based on its experience in providing wireless and other exchange services, BellSouth has been a major participant in telecommunications ventures in other nations, including Australia, Denmark, Argentina, France, India, New Zealand, Mexico, Uruguay, the United Kingdom, and Venezuela. In order to qualify for participation abroad, BellSouth often must submit a certificate from the FCC that it is a *bona fide* provider of the relevant communications service. Thus, the exclusion of U.S. companies from PCS domestically will directly affect these firms' ability to compete internationally and thus diminish U.S. competitiveness.

⁷ *Enhanced Technologies R&O* at ¶1.

can be internationally competitive if its most capable companies, as well as new entrants, are encouraged to be on the cutting edge of the development and deployment of advanced technologies and services.⁸

Moreover, defining the core goal of this proceeding as the development of a family of new wireless radio services in furtherance of Section 7 of the Act will justify the massive changes and relocations of existing licensees. The Commission proposes to utilize spectrum for PCS that is heavily used by fixed microwave licensees. Bands totaling 220 MHz of spectrum in the 2 GHz region have been reallocated for the *Emerging Technologies* spectrum reserve.⁹ This "spectrum reserve," unlike other reserve bands, is not unoccupied spectrum. It is currently used for "important and essential functions" by public safety users, private industrial users, utility companies, and even cellular companies.¹⁰ Because this spectrum is not unoccupied, existing licensees should only be disturbed if a *new* service is being created which advances the United States' global competitiveness.

B. The Values the Commission Seeks to Further Should Revolve Around the Core Goal

In the *NPRM*, the Commission enunciated four values that it will balance in arriving at its decision: universality, speed of deployment, diversity of service, and competitive delivery.¹¹ These factors must be evaluated in light of the ultimate goal of the proceeding — to encourage the development and deployment of new, advanced technologies and services that will benefit the American public and enhance U.S. competitiveness — as follows:

1. Universality — encouraging the wide availability of new wireless services on a competitive, discretionary basis at reasonable prices;

⁸ See *NPRM*, 7 FCC Rcd. at 5688.

⁹ *Emerging Technologies R&O* at ¶ 21.

¹⁰ *Id.*

¹¹ *NPRM*, 7 FCC Rcd. at 5679.

2. Speed of deployment — creating a licensing process which ensures that new wireless services will be developed and delivered in a prompt, yet responsible manner;
3. Diversity of service — fostering the availability of a wide variety of new wireless services from many different U.S. companies; and
4. Competitive delivery — creating a "level playing field" among the providers of new wireless services.

The BellSouth proposal which follows applies these values in a manner consistent with the core goal of creating new services and fostering global competitiveness.

II. BELLSOUTH'S PROPOSAL FOR PCS WILL BEST FACILITATE ACHIEVEMENT OF THE CORE GOAL OF ENCOURAGING THE INTRODUCTION OF NEW WIRELESS SERVICES

BellSouth has carefully evaluated how to structure a regulatory environment for new personal communications services that will carry out the Commission's mandate to encourage the introduction of new services and technologies. The essential elements of the proposal are as follows:

- The services to be offered in the 2 GHz spectrum are low-power wireless services that offer personal mobility while achieving high spectral efficiency through intensive frequency reuse.
- There should be five licensees authorized in each area to provide these services, with each licensee being assigned a band of 20 MHz. There should also be one licensee in each area allotted 10 MHz of spectrum for local loop applications in support of LEC and competitive access provider services. 20 MHz of spectrum should be allocated for unlicensed PCS applications. Finally, 3 MHz of spectrum, divided into sixty 50 kHz blocks, should be allocated in the 900 MHz band for both paired and unpaired "narrowband PCS," such as advanced messaging services.
- Licensing for new 2 GHz services should be for the same geographic areas used for cellular and interactive television licensing — Metropolitan Statistical Areas ("MSAs") and Rural Service Areas ("RSAs").
- All parties should be permitted to participate in auctions, receive licenses, and acquire licenses through assignments and transfers.

- Auctions should be used for assigning frequencies to licensees. Bidders should only have to establish their creditworthiness (including posting a deposit if necessary), and pay a reasonable, non-refundable fee; the winning bidder should be required to demonstrate its legal, technical, and financial qualifications. Licenses should be freely transferable.
- A. The New Personal Communications Services Authorized in the 2 GHz Band Should Be a New Low-Powered Microcell Service**

At the outset, the Commission must establish that the 2 GHz PCS services at issue in this proceeding are new low-power microcell services for the following reasons:

- A broad generic definition of PCS does not focus on creating *new* personal communications services and enhancing U.S. competitiveness — the core goal of the proceeding;
- The types of PCS that form the record in this proceeding are low-power microcell services;
- Innovative *new* forms of PCS would be discouraged or precluded altogether if high-power large-cell service is included;
- High-power cellular clones will deter technological innovation and will not be spectrally efficient in this band.
- High-power services would present interference and tower regulation problems requiring the allocation of significant FCC resources; and

1. The FCC's PCS Definition Must Focus on *New* Low-Powered Services

The Commission proposed to define PCS as "a family of mobile or portable radio communications services which could provide services to individuals and business, and be integrated with a variety of competing networks. . . . [T]he primary focus of PCS will be to meet communications requirements of people on the move."¹² This generic definition of PCS is too broad and unfocused for use in the "*New Personal Communications Services*" docket. The generic definition of PCS ("*Generic-PCS*") covers not only new personal communications services ("*New-PCS*"), but also a wide

¹² *NPRM*, 7 FCC Rcd. at 5689.

variety of existing services that satisfy the generic description ("Existing-PCS").¹³ For instance, existing-PCS would include services such as the Public Mobile Services (cellular, conventional mobile telephone, and common carrier paging service),¹⁴ mobile satellite service,¹⁵ and the Private Land Mobile Radio Services,¹⁶ as well as cordless telephone and similar unlicensed services. This proceeding, however, has little or nothing to do with these services which have already been established for a particular purpose and with certain technical parameters in other rulemakings.¹⁷

The announced purpose of this rulemaking is to allocate spectrum and establish a licensing and regulatory system for *New-PCS*.¹⁸ Specifically, the Commission has sought to determine "which

¹³ This division of PCS into categories parallels the approach taken by Telocator in developing PCS service descriptions. Telocator has defined PCS as "a broad range of individualized telecommunications services that enable people or devices to communicate independent of location." Telocator PCS Section, *PCS Service Descriptions* at 1 (July 22, 1992). This corresponds to the FCC's definition, which BellSouth has characterized as Generic-PCS. Telocator then divides PCS in general into "existing" and "emerging" PCSs. Telocator enumerates the following as Existing PCSs: Landline/Enhanced Landline, Pay Phone, Dispatch/Enhanced Dispatch, SMR/Enhanced SMR, Mobile Data, Paging/Enhanced Cellular, Cordless, and Air-to-Ground/Enhanced Air-to-Ground. The Emerging PCSs, according to Telocator, are: Telepoint, Advanced Telepoint, Personal Telecommunications Service ("PTS"), Advanced Cordless/Wireless Business, and Mobile Satellite. *Id.* at 3. Telocator's Emerging PCSs are precisely the services that would be fostered by BellSouth's proposal, while a generic definition such as the FCC has proposed would permit the spectrum to be used to a large extent for services identical to those already available.

¹⁴ See generally 47 C.F.R. Part 22. The Rural Radio Service, Offshore Radio Service, and air-ground mobile services that are also covered by Part 22 may or may not fall within the scope of Generic-PCS.

¹⁵ See 47 C.F.R. Part 25.

¹⁶ The Existing-PCS offerings in the private land mobile radio services include trunked and conventional operations in the Public Safety Radio Services, Special Emergency Radio Service, Industrial Radio Services, and Land Transportation Radio Services. In these services, some users are licensed for their own private radio systems; some users share systems with other users; and some obtain radio service from entrepreneurs licensed to offer service on a commercial basis such as Specialized Mobile Radio ("SMR") operators. See generally 47 C.F.R. Part 90. The Radiolocation Service, which is included in the Private Land Mobile Radio Services, would appear to be the only Part 90 service not falling within the definition of Generic-PCS.

¹⁷ Existing-PCS licensees may use new technologies or provide alternative services to the extent they are consistent with the purpose of the spectrum allocation. *E.g.*, 47 C.F.R. § 22.930 (cellular technical flexibility); *Fleet Call, Inc.*, 6 FCC Rcd. 1533 (1991) (SMR technical flexibility).

¹⁸ This is clear from the caption of the proceeding, "Amendment of the Commission's Rules to Establish *New Personal Communications Services*" (emphasis added), as well as from the *Notice of Inquiry* initiating the proceeding, where the Commission distinguished cordless telephones, paging, car telephones, and portable
(continued...)

new PCSs are needed, where in the spectrum those services should be provided if at all, how much spectrum should be allocated to them, whether and how the services should be regulated, and what technical standards should be adopted."¹⁹ The Commission must resolve these issues; it may not avoid its responsibility by giving licensees open-ended authority to experiment.²⁰

In deciding to create a spectrum reserve for new technologies, the Commission distinguished between new services and expansion of existing services. To justify access to the *Emerging*

¹⁸(...continued)

cellular telephones from "even more advanced forms of PCSs . . . hav[ing] significant improvements over those that are currently available, including cellular service." *Notice of Inquiry*, 5 FCC Rcd. at 3995.

¹⁹ *Id.* (emphasis added). The Communications Act sets out a carefully balanced and specific regulatory scheme for the creation of new services and modification of existing licenses. Section 303 of the Act states, in relevant part, that the Commission

shall —

- (a) Classify radio stations;
- (b) Prescribe the nature of the service to be rendered by each class of licensed stations and each station within any class;
- (c) Assign bands of frequencies to the various classes of stations, and assign frequencies for each individual station and determine the power which each station shall use and the time during which it may operate;
- (d) Determine the location of classes of stations or individual stations;
- ...
- (f) Make such regulations not inconsistent with law as it may deem necessary to prevent interference between stations . . . : provided, however, that changes in the frequencies, authorized power, or in the times of operation of any station, shall not be made without the consent of the station licensee unless after a public hearing, the Commission shall determine that such changes will promote public convenience or interest . . . ; [and]
- (g) Study new uses for radio, provide for experimental uses of frequencies, and generally encourage the larger and more effective use of radio in the public interest[.]

47 U.S.C. § 303. It is well-established that the Commission's primary role is to police both the qualifications of licensees and their transmissions. *See National Broadcasting Co. v. FCC*, 319 U.S. 190, 214-15 (1943).

²⁰ The courts have held that while the FCC has broad experimental authority, it cannot use such authority to avoid its responsibility for properly classifying licensees and regulating new services. *See, e.g., National Ass'n of Broadcasters v. FCC*, 740 F.2d 1190, 1199-1200, 1210 (D.C. Cir. 1984). In the *Rogers Radio* case, the D.C. Circuit observed that experimentation is a preliminary step allowing the Commission "to obtain information concerning the capabilities and problems of [a proposed] technology. Equipped with such information, the Commission can set standards for [new] systems to ensure that their operation will serve the public interest, convenience and necessity." *Rogers Radio Communications Services, Inc. v. FCC*, 593 F.2d 1225, 1230 (D.C. Cir. 1978). Under this analysis, it is essential that the Commission determine at the outset what it means by New-PCS — in other words, the Commission should declare what new PCSs require a spectrum allocation and what technical characteristics will facilitate the introduction and flowering of those new services.

Technologies spectrum reserve, the Commission said the proponents of "new services . . . should demonstrate that the service makes innovative use of a new technology and that the technology is most appropriately suited to operate [] in the 2 GHz region."²¹ Spectrum from the reserve band was made available for the expansion of existing services only if "the expansion would offer some substantial improvement in either quality of service or spectrum efficiency. Such improvements would generally be provided through use of new technology."²² Thus, PCS must be defined as a *new* service and must be governed under technical parameters consistent with the wireless innovation/global competitiveness purpose of the *Emerging Technologies* proceeding and record herein.²³

The forms of new services driving this proceeding are low power, digital wireless services that are either currently unavailable or available only to a limited extent. As the Commission observed in the *NPRM*: "Most of the PCS experiments that we have authorized employ small cell configurations utilizing relatively low power base stations with antennas relatively close to the ground. The mobile units in these experiments are relatively low power."²⁴ Commissioner Quello recently observed that New-PCS was different from the cellular service based on its low power, microcell nature:

There is a tremendous effort world-wide to develop new and innovative mobile telecommunications services. Examples include . . . cellular and now micro-cellular mobile systems. . . .

²¹ *Emerging Technologies NPRM*, 7 FCC Rcd. at 1546.

²² *Id.* The Commission declined to define precisely which services would operate in the 2 GHz band, but it made clear that the spectrum was to be used only for *new* services, so that U.S. companies can keep pace with foreign competitors in nations that allocate spectrum for deployment of new technologies. *Emerging Technologies R&O* at ¶¶ 9, 14.

²³ The Commission need not engage in "picking winners and losers" in making this decision because it need not limit the New-PCS licensees' flexibility to offer alternative services or utilize alternative technologies. PCS licensees should be permitted to utilize their spectrum, within their defined service area, in any way consistent with specified technical parameters.

²⁴ *NPRM*, 7 FCC Rcd. at 5720; see also *id.* at 5728 ("the power levels likely to be used by most [PCS] devices should be relatively low").

Now, the Commission is exploring the next generation of mobile technology and services -- personal communication networks and services. Currently, the Commission has authorized 200 experiments with personal communication services. Typically, micro-cellular in design, these systems are providing a variety of ways to interconnect with the switched telephone network. Just this month the Commission recognized the significant contributions made by those experimenting with PCS by awarding tentative pioneer preferences . . . [including a] winner . . . using cable TV physical plant interconnecting with micro-cells to deliver voice service. . . .²⁵

There are a wide variety of "microcell" services (e.g., CT-2, CT-2-Plus, CT-3, and PCN) that have been authorized or are under consideration in other nations, variants that have been the subject of experimentation in the United States, and services that are only emerging from the drawing board today (e.g., wireless PBX and LAN). While these services²⁶ differ in many ways, they have one predominant characteristic in common: they use low powered, highly localized radio transmissions ideally suited for low-mobility communications in applications such as pedestrian use in urban areas, on-campus or on-premises use, or in-building use. Thus, the record before the Commission regarding PCS involves almost exclusively low-power microcellular systems and the Commission cannot deviate therefrom.²⁷

Defining PCS as new low-power microcell services also fits solidly within the description of PCS contained in an article by a leading PCS proponent:

A defining technical characteristic of PCS is its high capacity and spectral efficiency. Assigned spectrum is divided into discrete channels, which are utilized by grids of low-power base stations with relatively small cell contours.

Because PCS cell contours are relatively small, PCS handsets can operate at low power and will be small, light, and inexpensive. PCS also will be useful for private in-

²⁵ FCC Commissioner James H. Quello, Global Alliances in Telecommunications: Partnership for Progress, Address at Intelevent 92, Cannes, France (October 21, 1992).

²⁶ At this point in the discussion, BellSouth does not address the 900 MHz narrowband PCS systems, for which high power appears to be appropriate. The 900 MHz portion of this proceeding did not originally constitute part of the PCS proceeding and also does not involve frequencies from the spectrum reserve. There are no existing spectrum users to be displaced from the 900 MHz bands at issue. See Section I.A., *supra*; "Narrowband PCS Pioneer's Preference Comments of BellSouth" filed November 9, 1992 in ET Docket 92-100.

²⁷ See, e.g., *Motor Vehicle Manufacturer's Ass'n v. State Farm*, 463 U.S. 29 (1983).

building or campus-based wireless PBX systems because of the potential to assign frequencies to relatively discrete areas.²⁸

Based on the foregoing, BellSouth proposes that the Commission adopt the following definition of the new wideband personal communications services:

Wideband Personal Communications Service. A personal communications service characterized by high capacity and spectral efficiency, in which assigned spectrum may be divided into discrete channels which are utilized by grids of low-power base stations with small cell size.²⁹

The record of PCS experimentation leads BellSouth to propose that the power levels for licensed and unlicensed PCS should be specified as a power density limit to ensure consistency of power levels among the varied PCS technologies that might be developed and deployed. The peak power density level should be specified as 0.2 milliwatts per KiloHertz of equivalent channel bandwidth except for channel bandwidths less than 200 KHz which will have a maximum peak power limit of 40 milliwatts. For example, a technology that uses a channelized bandwidth of 100 KHz, such as CT2, would be allowed a maximum transmit power of 40 milliwatts, but a system that occupies a bandwidth of 1.5 MHz (1500 KHz) would be allowed a maximum transmit power of 300 milliwatts.³⁰

²⁸ K.A. Wimmer and J.B. Jones, *Global Development of PCS*, [June 1992] IEEE COMMUNICATIONS at 22. Mr. Jones is a vice president of American Personal Communications, a firm specializing in PCS technology development. BellSouth urges the Commission to adopt a PCS definition similar to this. See Appendix I at proposed § 99.5.

²⁹ This definition is included in the proposed rules in Appendix I.

³⁰ Because of the low power levels involved, BellSouth has not proposed limits on antenna height, or power reduction based on antenna height. With the proposed peak power density limits stated above, PCS base station coverage areas will remain small, thus negating the need for either high power levels or high antennas at the PCS base station. In order to preserve a balance between forward and reverse links, BellSouth proposes that the base station power levels also be limited to the proposed peak power density limits exclusive of antenna gains.

Telocator's analysis of PCS power levels described in the Telocator Joint Export Meeting Standards Contribution TR45.JEM/92.11.09.228 entitled *Analysis of Power Tradeoffs*, encourages avoidance of unnecessarily high power systems. BellSouth supports this document's view that OFS Microwave sharing, spectral efficiency, ease of coordination, low complexity, high data capacity, superb voice quality, etc., are best achieved with low peak power density limits.

(continued...)

2. Allowing High-Power, Large-Cell Services Would Discourage the Introduction of Innovative Microcell-Based Services and Not Be Spectrally Efficient

a. The Difficulties with Converting from High to Low Power and the Experience in the United Kingdom

If the Commission were to adopt rules on antenna height, power, and other technical parameters that permitted PCS licensees to construct and operate high-power cellular-like systems, it is unlikely that innovative low-power microcell services will be deployed. This will be the case even if the rules are intended to be flexible enough to accommodate low-power systems. Licensees will likely construct high-powered cellular-like systems initially, both because of the cost and time involved in establishing the extensive infrastructure needed for microcell service and because of the immediate market potential of a new source of cellular service.

This is what happened with Personal Communications Networks ("PCN") in the United Kingdom and, accordingly, PCN is not developing as a new microcell service as originally anticipated. Dr. Chris Doyle of the University of Cambridge has studied the licensing process followed in the United Kingdom for PCN on behalf of BellSouth.³¹ As Dr. Doyle shows, PCN licensees were given the flexibility to use high or low power. Because of the nationwide coverage provisions and the government's encouragement of new cellular competition, the three PCN providers originally licensed chose to construct high-powered systems, and thus they will compete directly with cellular service

³⁰(...continued)

A Telocator Report, *Telocator Wireless Access Characterization Report TE/92-6-1/096R4* summarizes the characteristics of currently proposed PCS technologies. The stated peak power density limits proposed by BellSouth are consistent with the peak power densities achieved by these PCS technologies. Peak power density is calculated by dividing the peak power output of the transmitter (expressed in milliwatts), by the occupied channel bandwidth (expressed in kilohertz). According to Telocator, the technologies most appropriate for this discussion are designated as technologies "proposed for emerging technologies band" and include QCDMA, BellCore FA1013, Omnipoint and DECT as well as some of the "other reference systems" technologies such as CT2, CT2+, CT3, and Handi-Phone.

³¹ Dr. Doyle's study is included as Appendix II.

providers for customers. As such, the innovative services that would result from a microcell environment are not developing.³²

The U.K. government's failure to limit high power PCN service development has led to the creation of additional cellular systems, rather than the creation of innovative new services. This result can and should be avoided in the United States.³³ By avoiding this mistake, the Commission can encourage the development of new services and expertise by U.S. companies, and will serve the core goal of global competitiveness in advanced technologies.

While licensees may intend high-power operation as merely an interim stage, once such a system has been constructed, the licensee may find it difficult to convert to microcell service at a later date. The difficulty arises both because of an embedded base of customer equipment designed for high-power service and because the architecture and infrastructure for a microcell system will differ substantially from that used in the high-power system.

b. Interference Considerations

The FCC recognized in the *NPRM* that to permit cellular-like service, different technical rules would be needed from those that would be needed for microcell PCS service.³⁴ What it apparently did not recognize, however, was that the adoption of cellular-oriented rules could effectively preclude microcell offerings. In other words, even though low-powered systems might be permitted by technical rules designed for high-powered systems, the existence or potential existence of nearby high-powered systems could pose major technical obstacles to the establishment of low-powered services.³⁵

³² See Doyle Study at 1, 9-14.

³³ See *id.* at 1, 18-19.

³⁴ Compare *NPRM*, 7 FCC Rcd. at 5720, ¶ 15 with *id.* at 5721, ¶ 116.

³⁵ See *Fleet Call, Inc.*, 6 FCC Rcd. 1533 (1991) (low-power system in band where high-power systems are the norm faces significant technical obstacles).

One significant obstacle is radio interference, particularly when the radio systems do not utilize spread-spectrum technology. The signal level that will cause interference is lower than the level needed for reliable coverage, and accordingly there is an area substantially beyond a cell's reliable zone of coverage where the cell's signal level will be sufficient to cause interference to both other PCS systems and to fixed microwave systems. Therefore, in a system with a cellular configuration, co-channel cells must be separated by cells using other frequency sets. The minimum distance before the frequency set can be reused depends on the size and power of the interfering cell.

A single high-powered cell will have a larger "interference contour" than a cluster of low-powered cells with the same reliable coverage, thus precluding frequency reuse for a greater distance. A co-channel cell within this interference contour would have a smaller reliable service area, due to the presence of the interfering signal, than if the interfering signal were not present. Therefore, a high-powered cell whose service contour is at or near a market boundary will radiate a signal into the adjacent market at a sufficient level to cause interference for some distance, which will make it more difficult, or even impractical, for the adjacent market PCS licensee to establish low-power microcell service in the affected area. Thus, in the absence of Commission-imposed low power limits, PCS licensees would have an incentive to avoid establishing microcell service in the fear that a nearby licensee could later disrupt the service by installing high-power cells.³⁶

Moreover, the use of high power creates a significantly greater likelihood that interference will occur to fixed microwave communications systems. The distances proposed by the *NPRM* for PCS licensees' coordination with co-channel microwave licensees are as great as 264 miles for high-power, high-elevation PCS licensees. Thus, high-power PCS operations have the potential for interfering with microwave operations located at considerable distances from the PCS transmissions.

³⁶ The fact that frequency coordination would be required will not eliminate this tremendous disincentive to the deployment of low-power systems when high power can be used by other co-channel licensees.

In any event, low-power PCS systems can often coexist in the same market area with co-channel fixed microwave users because PCS spectrum usage can be localized to areas that pose no significant interference potential. To protect microwave licensees from interference, a high-power system may have to avoid using frequencies that would be usable at low power levels. In the alternative, high-power systems may, as a result, require relocation of microwave users to other frequency bands in more instances than low-power microcell systems.

c. Manufacturing Problems

Finally, if the Commission permits both high- and low-power PCS applications, manufacturers will be faced with imprecise technical rules for guidance in developing new product lines. Because they will be unsure what type of equipment will be needed, they will be less likely to invest substantial sums in innovative product development. Otherwise, manufacturers run the risk of developing equipment for which there is no market. Thus, less-innovative equipment which satisfies the rules and does not require extensive research and development would likely be manufactured.

3. Authorizing High-Power Systems Would Not be Spectrally Efficient

Under the criteria established for use of the *Emerging Technologies* spectrum reserve, expansion of an existing service, such as cellular service, in the 2 GHz spectrum reserve band requires a substantial improvement in service quality or spectral efficiency.³⁷ A 2 GHz allocation for additional cellular clones would not result in substantial improvements in spectral efficiency or service quality over 800 MHz cellular service.³⁸

³⁷ See *supra* notes 21-22 and accompanying text.

³⁸ In Dr. Doyle's study of PCN developments in the United Kingdom he states that the Government's promotion of PCN as a cellular look-alike service has affected the service technology chosen for PCN implementation. This, in turn, has negatively impacted on the spectral efficiency of PCN service in the U.K. See Doyle Study at 13.

First, maximum spectral efficiency — i.e., high capacity within finite spectrum — mandates frequency reuse, which mandates small cells, low power, and short antennas. A low-power microcell system can achieve a much higher level of spectral efficiency than a high-power cellular system because frequencies are reused many more times within a serving area, due to the more geographically restricted coverage and interference areas of a given cell. This permits the system operator to make much more calling capacity available in areas of high demand. A low-powered microcell system can potentially offer as much capacity within the geographically limited coverage area of a single microcell, such as the 1900 block of M Street, as a high-powered cellular system can make available in a cell covering all of downtown Washington.

High-powered systems with large cells require more robust and complex mobiles and base stations. The mobile and portable subscriber units must be higher-powered in order to communicate with more distant base station receivers. Higher power imposes significant constraints on portables in particular, because it requires larger, heavier batteries and circuitry, thus reducing battery life and increasing cost. Low-power systems, which require only short-range transmissions from the portables, are smaller, lighter, less expensive, and longer-operating than the higher-powered units. These are extremely important factors for subscriber acceptance. Therefore, low-power systems will have a greater likelihood of achieving a mass market.

Second, the allocation of additional spectrum at 2 GHz for cellular clones would tend to decrease spectral efficiency in the delivery of cellular service. The cellular industry is already converting to more efficient digital technology³⁹ which will permit substantial increases in capacity over the next ten years. A number of major-market systems are currently being converted to digital TDMA service, which will provide up to three times the current capacity. By 1994 some systems are

³⁹ See 47 C.F.R. § 22.930.

expected to be converted to CDMA, a technology that may be able to provide as much as a fifteenfold improvement in capacity.

The use of these technologies may provide sufficient additional capacity to accommodate the expected growth in demand for cellular service from about 9 million subscribers in 1992 to 37.5 million subscribers in 2002.⁴⁰ Accordingly, the creation of just one identical new cellular competitor, through the allocation of 25 MHz of additional spectrum for large-cell cellular service would spread this demand over 75 MHz instead of 50 MHz, resulting in a net *decrease* in spectral efficiency of 33 percent.⁴¹ *Creating five new cellular clones, with 20 MHz each, would result in 150 MHz being used for a service that can be provided within 50 MHz, for a net decrease in spectral efficiency of 67 percent.*⁴²

Third, the introduction of one or more new cellular competitors would delay the introduction of TDMA and CDMA, due to lowered or even negative subscriber growth rates for the existing licensees. The new service providers would be able to accommodate the incremental increase in demand for cellular service as well as some of the customers already served. Carriers currently planning to introduce digital technology to meet increasing demand would have to reconsider their plans if they could no longer count on significant subscriber growth, resulting in delay or abandonment of the transition to digital cellular service.⁴³

⁴⁰ See Telocator PCS Section, *PCS Demand Forecast* at 7, Matrix 2 (May 1, 1992) (projected demand in 2002 for cellular and advanced cellular service, assuming New-PCS licensing in 1997).

⁴¹ The number of subscribers nationwide per MHz of spectrum would decline from 750,000 to 500,000.

⁴² This would result in a decline in the number of subscribers per MHz from 750,000 to 250,000.

⁴³ The allocation of spectrum for new cellular licensees could also result in degraded service quality because cellular service quality improvement depends on the introduction of new digital technologies. As shown in the previous paragraph, the entry of new cellular clones, even in a new frequency band, would delay this improvement in quality. Moreover, the entry of new cellular competition could actually lead to a decline in overall quality if it resulted in a price war. In an intensely competitive environment, cellular carriers would be forced to cut quality in order to compete on price, and their ability to finance quality improvements would be lessened.

Fourth, the widespread deployment of very small cells in a high power environment is impractical because small cells have to be considerably removed from large cells using the same channel set due to the strength of the interfering signal from the large cells. Cellular service was designed to provide high-capacity mobile telephone service to vehicles moving at high speeds, while achieving more spectral efficiency than could be accomplished by using a single, high-powered transmitter to cover an entire market. The cellular concept allows frequencies to be reused within a market by division of the market into cells, or coverage areas, that are considerably smaller than the coverage area of a conventional two-way land mobile transmitter. If cells cover a smaller area than a metropolitan area, a fast-moving vehicle may traverse several cells during a call, which will require the hand-off of the call from one cell to the next.

4. High-Power PCS Services Would Require Substantially More FCC Staff Resources Than Low-Power

If low-power systems are built adjacent to co-channel high-power systems, the resolution of resulting interference problems will require substantial FCC staff resources. Merely requiring coordination with co-channel PCS operators within the interference range of the high-power cells will not solve this problem, as is clear from the Commission's experience with cellular service.

The Commission requires cellular licensees to engage in frequency coordination with all co-channel licensees for a distance of 75 miles, but there are still a very large number of interference complaints. Many of these complaints arise because of disparities in power levels between the cells in adjacent cellular systems. Large-cell systems operating at high power have

